Sources of emission on a dairy

Nutrition
- NH₃, CH₄, H₂S, N₂O

Feed Management
- VOC, PM, Odor

Milk Parlor
- NH₃, VOC, Odor, H₂S

Housing - Freestall Barns
- NH₃, VOC, Odor, CH₄, H₂S

Expected pollutants for each source in order of importance

Suggested BMPs for emissions reduction

Tier 1
- Properly manage level of dietary protein (%CP) in diet to match, rather than exceed, an animal’s needs (NH₃, N₂O, Odor)
- Properly manage and minimize overfeeding sulfur in the diet (H₂S, Odor)

Tier 2
- Regularly remove spilled and unused feed from feeding area (VOC, Odor, PM)
- Manage or minimize the mixing of feed during windy times (PM)

Tier 3
- Use recycled parlor (clean) water used for flushing/cleaning parlor and holding area (NH₃, Odor)
- Ensure proper ventilation (NH₃, Odor, and PM)

Suggested BMPs for emissions reduction

Tier 1
- Practice group and/or stage of lactation feeding (NH₃)

Tier 2
- Properly cover and manage ensiled feedstuffs (VOC, Odor)

Tier 3
- Increase the level or quality of starch in the diet (CH₄)
- Utilize feed additives to maximize efficiency (NH₃, H₂S, CH₄)

Store feed in a sheltered storage structure (VOC, Odor, PM)

Treat recycled water used for flushing/cleaning holding area (NH₃, Odor)

Treat recycled lagoon water used for flushing (NH₃, Odor)

Alleyway floor texture and type (NH₃, VOC, Odor)

Manure removal technology and efficiency (NH₃, VOC, Odor)

Adopted from the Air quality management policy and BMPs for dairy operations report 2013, Yakima Regional Clean Air Agency
Sources of emission on a dairy

- Housing - Drylot Pens
  - NH₃, PM, Odor, H₂S, CH₄, VOC, N₂O

- Grazing Management
  - NH₃, N₂O

- Manure Storage
  - Liquid: NH₃, H₂S, CH₄, Odor, VOC
  - Solid: NH₃, H₂S, PM, CH₄

- Land Application
  - NH₃, PM, Odor, N₂O

Expected pollutants for each source in order of importance

- NH₃, PM, Odor, H₂S, CH₄, VOC, N₂O
- NH₃, N₂O
- Liquid: NH₃, H₂S, CH₄, Odor, VOC
- Solid: NH₃, H₂S, PM, CH₄
- NH₃, PM, Odor, N₂O

Suggested BMPs for emissions reduction Tier 1

- Spread (harrow) manure frequently (NH₃, PM)
- Surface moisture content management (NH₃, N₂O, VOC, Odor, CH₄, H₂S, PM)
- Stock appropriate number of animals (NH₃, N₂O)
- Use rotational grazing (NH₃, N₂O)
- Manure solids separation (NH₃, VOC, Odor, H₂S, CH₄)
- Properly manage the composting of solid manure (H₂S, Odor, PM, CH₄)
- Properly manage stockpiled manure (H₂S, Odor, PM)
- Apply nutrients according to agronomic recommendations based on soil and manure test results (NH₃, N₂O)
  - Inject or incorporate fertilizer into soil within 24 hours of application (NH₃, Odor)
  - Do not over-irrigate (NH₃, N₂O)
  - Apply during cool weather and on still rather than windy days (NH₃, Odor, PM)

Suggested BMPs for emissions reduction Tier 2

- Remove manure frequently (NH₃, PM)
- Incorporate wood chips in surface layer (NH₃, PM, Odor)
- Use straw bedding in drylot pens (NH₃, PM, Odor)
- Knockdown and remove fence line manure (VOC, Odor)
- Lagoon or storage covers (NH₃, H₂S, VOC, Odor, CH₄)
- Scrub Exhaust of enclosed waste containers (CH₄, Odor, H₂S)
- Utilize cover crops (NH₃, N₂O, PM)
- Apply N fertilizer below no-till residue (NH₃, PM)

Suggested BMPs for emissions reduction Tier 3

- Urease inhibitors (NH₃, N₂O)
- Provide shade for cattle (NH₃, PM)
- Sitting of water trough within pen (NH₃, PM)
- Irrigate immediately after grazing (NH₃)
- Installation of an anaerobic digester (CH₄)
- Surface aeration of lagoons (NH₃, H₂S, VOC)
- Reduce the pH of manure (NH₃, CH₄)
- Encourage purple sulfur bacterial formation in lagoons (H₂S, Odor)
- Installation of windbreaks or shelterbelts (Odor, PM)

Adopted from the Air quality management policy and BMPs for dairy operations report 2013, Yakima Regional Clean Air Agency